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(54) CAVITY-CONTAINING POLYESTER-BASED LAMINATED FILM ROLL

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a cavity-containing polyester-based laminated film roll which is excellent in concealing properties, cushion properties, surface strength and film making stability, reduced in the difference of color tones with a pictorial design-printed layer, reduced in fluctuations in the color difference in a film roll, excellent in the printing quality of the pictorial design-printed layer when used as a decoration sheet and reduced in changes in color tone when flawed.

SOLUTION: In the cavity-containing polyester-based laminated film roll, a cavity-containing layer (A layer) and a layer (B layer) made mainly of a polyester resin laminated on at least one face of the A layer, wherein the A layer and the B layer contain respectively at least two or more kinds of coloring pigments, the A layer has 0.20 pieces/μm or more of the cavity laminating number density, the reflectance ratio (R650/R450) on the film surface at 450 nm and 650 nm is 1 to 5, and the difference between the maximum and minimum of the color difference (ΔE) in the same film roll is

not greater than 1.0.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] this invention -- printing nature, film production stability, secondary elaboration justice, heat dimensional stability, ink metastatic, and a V cut -- it excels proper and is related with the suitable cavernous content polyester system laminated film roll for a makeup sheet which sticks on a metal, wood, etc. and is used for them.
[0002]
[Description of the Prior Art] Various application expansions are progressing from the point excellent in the printability according [the synthetic paper which uses synthetic resin as the main raw material] to a water resisting property, surface gloss, and a smooth front face etc. In a synthetic paper raw material, the polyester system resin represented by

especially polyethylene terephthalate has high thermal resistance, has the description that rigidity is high, and is expanding the use range.

[0003] Moreover, a hot printing printing application (JP,63-280687,A) is begun, and it is widely used also as various films for printing by the cushioning properties discovered according to cavernous content structure. The method of making it mix and distribute and using into polyester, the thing, polyester resin, the thermoplastics of immiscible nature, etc. in which the cavity was formed around the particle, as a nucleus of the porosi is learned by mixing and extending a non-subtlety particle in polyester as a cavernous content polyester system film used for such an application. Especially the latter is widely adopted from the point which can carry out [lightweight]-izing of the film.

[0004] The polyolefine system resin which is used for this porosi and which is represented by polypropylene resin and poly methyl pentene resin (JP,49-34755,A) as a porosi agent or polystyrene system resin (for example, JP,49-2016,B, JP,54-2955,B) is proposed.

[0005] However, only by making a cavity form simply, depending on the magnitude of a cavity, a configuration, and a number, it becomes a film with weak surface reinforcement, and there is a problem in the application which needs surface reinforcement.

[0006] On the other hand, as for the sheet used between the base material of the makeup version, and a pattern printing layer about a building material, or the sheet (film) used for a makeup sheet, the pattern pattern of a high design is usually given to a front face. Furthermore, since it is the ingredient used for a front face, a front face may carry out wounded. Especially when strong contact and a strong scratch are received, damage on the wounded section may also become large and the front face and the interior of a film may expose it to the front face of a makeup sheet. And since the color tone of the wounded section differs from a surrounding color tone when the color tones of the pattern printing layer formed in a film and its front face differ greatly, the wounded section is conspicuous and the design nature of the front face of a makeup sheet is spoiled greatly. For this reason, it is required that the color of this film used as a base material should not differ from the upper pattern layer extremely.

[0007] As a makeup sheet, a vinyl-chloride-resin sheet is the most common. However, when a vinyl-chloride-resin sheet is used, a plasticizer shifts to an adhesives layer, the adhesive agent between base materials is caused, or since heat dimensional stability is bad, telescopic motion by heat arises, and there is a problem of causing Siwa. Furthermore, a vinyl-chloride-resin sheet generates chlorine in the case of incineration, and it is said that it becomes the factor of acid rain and dioxin generating, and the request of the makeup sheet which does not use a vinyl-chloride-resin sheet from a viewpoint of environmental protection, either has become strong.

[0008] Moreover, the adhesive property between base materials is inferior similarly about the makeup sheet of a polypropylene system, or there is a problem of the productivity in the wrinkle or presswork by heat dimensional stability being bad not going up.

[0009] For this reason, by this approach, although solution of the printing nature by coloring polyester film or a heat-resistant problem is tried by JP,11-268215,A, if priority is given to thermal resistance, rigidity will become high and workability and cushioning properties will worsen. On the contrary, since thermal resistance would become insufficient if priority is given to workability, it was not able to be said to be sufficient

solution means. Furthermore, in order to obtain sufficient concealment nature, it is necessary to make a coloring agent contain in large quantities, and there is also a problem that film production nature gets worse remarkably, with a film with thin thickness.
[0010]
[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer [cancel the fault of the above-mentioned conventional technique and excel in concealment nature, cushioning properties, surface reinforcement, and film production stability, and the difference of a color tone with a pattern printing layer is small, and there is little fluctuation of the color difference in a film roll, to excel in the printing grace of a pattern printing layer, when it uses for a makeup sheet, and] a cavernous content polyester system laminated film roll with little color tone change at the time of wounded.
[0011]
[Means for Solving the Problem] Namely, the cavernous content layer to which invention of the 1st of this invention mainly becomes polyester resin and said polyester resin from the constituent containing immiscible thermoplastics (A horizon), It is the cavernous content polyester system laminated film roll with which the laminating of the layer (B horizon) which mainly becomes at least one side of an A horizon from polyester resin was carried out. Said both A horizons and B horizons contain at least two or more sorts of color pigments. And the cavernous laminating number density as which an A horizon is defined by the following formula (1) is 0.20 or more pieces/micrometer. Furthermore, said film front face is a cavernous content polyester system laminated film roll characterized by for the reflection factor ratios (R650/R450) in 450nm and 650nm being 1-5, and the difference of the maximum of the color difference (deltaE) within the same film roll and the minimum value being 1.0 or less.
Cavernous laminating number density (a piece/micrometer) = the number of cavities of the A horizon in the film thickness direction (individual) Thickness of a /A horizon (micrometer) -- (1)
[0012] The 2nd invention is a cavernous content polyester system laminated film roll given in the 1st invention characterized by the mean particle diameter of said color pigment being 5 micrometers or less.
[0013] The 3rd invention is a cavernous content polyester system laminated film roll given in invention of the 1st or 2 to which thermoplastics immiscible to said polyester resin is characterized by including polyolefine system resin and polystyrene system resin.
[0014] The 4th invention is a cavernous content polyester system laminated film roll at invention of the 1st, and 2 or 3 characterized by 0.70-1.45g /of apparent density gravity of said film being [cm] 3.
[0015] The 5th invention is a cavernous content polyester system laminated film roll given in invention of the 1st, and 2, 3 or 4 characterized by the thickness of said laminated film being 100 micrometers or less.
[0016]
[Embodiment of the Invention] In order are not conspicuous and to carry out the crack at the time of making small the difference of the color tone of this pattern printing layer and film, and a pattern printing layer carrying out wounded to grain tone printing used for many of panels, it is required for the reflection factor ratios on the front face of a film in 450nm and 650nm (R650/R450) to be 1-5. 3.0 is desirable especially desirable and the upper limit of said reflection factor ratio is 2.5. Moreover, 1.2 is desirable especially

desirable and the lower limit of said reflection factor ratio is 1.3. Since said reflection factor ratio (R650/R450) is too small, or the difference of the color tone between a pattern printing layer and a film becomes large in being too large, the crack at the time of a pattern printing layer carrying out wounded is not conspicuous and desirable.

[0017] when thickness is a split film 100 micrometers or less, in order [moreover,] to secure concealment nature -- a coloring agent -- extensive -- not containing -- it does not obtain but film production stability gets worse conversely. On the other hand, since whenever [concealment], and a whiteness degree are added by giving cavernous content structure into a film, the content of a color pigment can be decreased and it can respond to industrial production enough also in respect of the ductility of a film further.

[0018] Furthermore, it becomes possible by making a film into a laminated structure to give a function which is different on each class. The function to specifically secure ductility in the cavernous content layer (A horizon) which is a main stratum is given, it is the layer (B horizon) which carries out a laminating to at least one side of said A horizon and which mainly consists of polyester resin, it becomes possible to make a lot of impossible color pigments contain in a monolayer, and the function which the further concealment nature raises can be given.

[0019] Moreover, by making the interior of a film into cavernous content structure, it becomes possible to give moderate cushioning properties and moderate softness to a film, and it becomes possible with conventional coloring polyester film to give the processing imitation nature which was not obtained.

[0020] The difference of the maximum of the color difference on the front face of a film within the same film roll (deltaE) and the minimum value needs to be 1.0 or less. 0.8 or less are desirable especially desirable, and the difference of the maximum of said color difference and the minimum value is 0.6 or less. Here, the color tone L value of the film measured using the color difference meter, b value, and a value are expressed in the square root of the sum of the numeric value squared, respectively as the color difference. If the difference of the maximum of said color difference (deltaE) and the minimum value is too large, color tone fluctuation within the lot of a film roll will become large. Therefore, the design nature after giving a pattern printing layer will be spoiled, or the stability of a product will be spoiled.

[0021] In order to make small the difference of the maximum of the color difference (deltaE) of a film, and the minimum value, it becomes important to decrease the segregation of the raw material inside to receive distribution of the color pigment in a film, a feeding system, or an extruder.

[0022] It specifically considers as the approach of improving the dispersibility of a color pigment, the masterbatch which distributed the color pigment in resin beforehand is created, and the approach of carrying out mixed extrusion with the extruder for film production and the approach using an extruder with high stirring effectiveness are suitable for next. Furthermore, in a feeding system, in order to prevent the segregation of resin, it is effective independent or to use [using the high metering installation and high concrete supply system of measuring precision of resin or] together the approach of using a facility of re-stirring.

[0023] Moreover, about a cavernous content layer (A horizon), it is important to make the cavernous condition under film roll uniform about the cross direction and the flow direction of a film, since a whiteness degree and whenever [concealment], are greatly

affected according to the number of cavities or the gestalt of a cavity in order to be stabilized and to acquire quality, such as a whiteness degree and whenever [concealment], on fixed level.

[0024] However, in order to be stabilized and to acquire quality, such as a whiteness degree and whenever [concealment], on fixed level, generally it is very difficult for very advanced film production technique and production control to be needed, and to make small fluctuation of the color tone of said cavernous content layer (A horizon) to a limit.

[0025] Then, it becomes possible to make smaller the difference of the maximum of the color difference of a film, and the minimum value in a film roll by making a film into a laminated structure and preparing the polyester resin layer (B horizon) in which the fluctuation factor of a color tone contains fewer color pigments in the outside of said cavernous content layer (A horizon).

[0026] In order are not conspicuous and to carry out the crack at the time of making small the difference of the color tone of a pattern printing layer and a film, and a pattern printing layer carrying out wounded in the cavernous content polyester system laminated film roll of this invention In order to set the reflection factor ratio on the front face of a film in 450nm and 650nm (R650/R450) to 1-5 and to set said reflection factor ratio (R650/R450) to 1-5 It is required for the layer of both a cavernous content layer (A horizon) and the layer (B horizon) which mainly consists of polyester resin to make at least two or more sorts of color pigments contain.

[0027] Various things shown below can be used as a color pigment. As white pigments, the titanium dioxide of a rutile mold or an anatase mold, a zinc white, the white lead, a lead sulfate, RITOBON, zinc sulfide, antimony oxide, etc. can be used.

[0028] Furthermore, as an extender with which lusterless effectiveness is acquired, baryte, precipitated barium sulphate, a barium carbonate, calcium carbonate powder, precipitated calcium carbonate, gypsum fibrosum, asbestos, clay (kaolin), silica powder, a fines silicic acid, diatomaceous earth, basic magnesium carbonate, an alumina white, a gloss white, a satin white, etc. can be used.

[0029] As a black pigment, magnetite (iron black), carbon black, aniline black, cyanine black, etc. can be used. As a yellow pigment, nitro pigments other than inorganic pigments, such as the chrome yellow, zinc yellow, a barium chromate, cadmium yellow, Synthetic Ochre, ocher, Titanium Yellow, a lead cyanamide, and calcium plumbate, such as azo pigment, such as Hansa yellow, and naphthol yellow, can be used as an organic pigment.

[0030] As an orange pigment, azo pigment, such as permanent Orange, etc. can be used as an organic system pigment other than inorganic system pigments, such as the shakkou chrome yellow and a chromium par million.

[0031] As red pigments, azo pigment or the Quinacridone system pigments, such as Permanent Red, etc. can be used as an organic pigment other than inorganic pigments, such as red ocher, a minium, vermilion, cadmium red, cadmium Mercury red, and antimony vermilion.

[0032] As a purple pigment, it is cobalt purple [(basic genonema lake pigments other than inorganic pigments, such as Co3(PO4) 2 or Co3(AsO4)2] or manganese purple, such as azo pigment, such as the fast violet B, and Violet Lake, can be used as an organic pigment.).

[0033] As a blue pigment, acid toner pigment pigments, such as phthalocyanine pigment,

such as a copper phthalocyanine blue, and an alkali blue lake, etc. can be used as an organic pigment other than inorganic pigments, such as ultramarine blue, Berlin blue, cobalt blue, cerulean blue, and a zaffer.

[0034] As green pigments, phthalocyanine pigment, such as nitroso pigment, such as pigment Green B, and Phthalocyanine Green, etc. can be used as an organic pigment other than inorganic pigments, such as chrome green, zinc green, chromic oxide, pilus JIAN, emerald green, or cobalt green.

[0035] About the inorganic pigment which the shape of a grain shape presents three-dimensional configurations, such as the shape of a globular shape, a false globular shape, and a cylinder, among the above-mentioned color pigments, it is desirable that mean particle diameter (the SEM method) is 5 micrometers or less. 3 micrometers is still more desirable especially desirable, and the upper limit of mean particle diameter is 1 micrometer. Moreover, 0.05 micrometers is 0.1 micrometers desirable still more preferably, and the lower limit of mean particle diameter is 0.3 micrometers especially preferably. If the mean particle diameter of a color pigment is too small, since the surface area per volume will become large, adsorption of moisture increases, and the fall of the intrinsic viscosity of resin increases by hydrolysis, or it further becomes easy to condense color pigments. On the other hand, if mean particle diameter is too large, since a film will fracture at the time of film manufacture or the problem of the result nature of printing falling will occur, it is not desirable.

[0036] In this invention, a color pigment may be made to contain during the polymerization reaction of polyester, it can use a twin screw extruder after a polymerization, can knead and distribute a color pigment, can be made into a masterbatch, and can adopt the approach of combining the specified quantity of this into polyester film etc. The method of preparing a master raw material, diluting a master raw material with the raw material which does not contain a color pigment substantially as the accommodation approach of a color pigment content, and adjusting a color pigment content is effective. In addition, in order to remove the big and rough particle condensed secondarily, as for a color pigment, it is desirable to perform at least one or more processings of crack processing, distributed processing, classification processing, filtration processing, etc. in advance.

[0037] About surface reinforcement, it is attained by making a film into a laminated structure, and carrying out void laminating number density of the cavernous content layer (A horizon) in the thickness direction of a film in 0.20 or more pieces/micrometer. It is more desirable especially desirable that a upper limit is 0.45 pieces/micrometer, and void laminating number density is 0.40 pieces/micrometer. Moreover, it is more desirable especially desirable that they are 0.25 pieces/micrometer, and a lower limit is 0.30 pieces/micrometer. Void laminating number density becomes the size of a void is large in less than 0.20 pieces/micrometer, and insufficient [surface reinforcement], cushioning properties there is little volume of a cavity and required are not attained, but printing nature and the imitation nature to processing get worse.

[0038] Moreover, as for the cavernous content polyester system laminated film roll in this invention, it is desirable that 0.70-1.45g /of apparent density gravity of a laminated film is [cm] 3. It is more desirable especially desirable that they are 1.40 g/cm3, and the upper limits of the apparent density gravity of a laminated film are 1.35 g/cm3. Moreover, it is more desirable especially desirable that they are 0.80 g/cm3, and the

lower limits of the apparent density gravity of a laminated film are 0.85 g/cm3. If the apparent density gravity of a laminated film is too small, since the reinforcement of a film falls and the handling by the post-processing process becomes difficult by generating of Siwa, surface cleavage, etc., it is not desirable. On the other hand, since a cavernous content becomes less enough when the apparent density gravity of a laminated film is too large, a property required as a makeup sheet which is the suitable application of this invention is no longer acquired fully.

[0039] In this invention, in order to control the above-mentioned cavernous laminating number density and apparent density gravity in the above-mentioned range, the content of immiscible thermoplastics is adjusted in the suitable range, or the approach of adjusting the extension temperature and draw magnification of a film is mentioned to the polyester resin shown below.

[0040] In the cavernous content polyester system laminated film of this invention, the thermoplastics immiscible to polyester resin which contains polyolefine system resin and polystyrene system resin in polyester resin is distributed in the shape of a particle. The phase which consists of polystyrene system resin is formed in the surroundings of a polyolefine system resin particle (core shell structure), and this is distributing as sea island structure in the polyester system resin of a matrix as a cavernous manifestation material particle. The cavity included in the film of this invention is formed in the interface of the polyester resin of the particulate material and matrix which consist of the immiscible thermoplastics concerned by extending the melting resin moldings which has the above-mentioned structure in the at least 1 direction.

[0041] The polyester resin used with the film of this invention is polyester which is made to carry out the polycondensation of the aromatic series dicarboxylic acid like a terephthalic acid, isophthalic acid, and naphthalene dicarboxylic acid or its ester, and ethylene glycol, a diethylene glycol, 1,3-propanediol, 1,4-butanediol and the glycol like neopentyl glycol, and is manufactured.

[0042] These polyester can be manufactured by approaches to which the ester exchange reaction of the alkyl ester and the glycol of aromatic series dicarboxylic acid besides an approach to which the direct reaction of aromatic series dicarboxylic acid and the glycol is carried out was carried out, such as carrying out a back polycondensation or carrying out the polycondensation of the diethylene glycol ester of aromatic series dicarboxylic acid.

[0043] As an example of representation of this polyester, polyethylene terephthalate, polytrimethylene terphthalate, polyethylene butylene terephthalate or polyethylene -2, 6-naphthalate, etc. are mentioned. These polyester may be homopolymers and may copolymerize the 3rd component. anyway, the polyester an ethylene terephthalate unit, a propylene terephthalate unit, a butylene terephthalate unit or ethylene -2, and whose 6-naphthalate unit are more than 70 mol % in this invention -- desirable -- more -- desirable -- more than 80 mol % -- it is more than 90 mol % especially preferably. In addition, the above-mentioned polyester resin may be used independently, or two or more sorts may use it, mixing.

[0044] Moreover, in the cavernous content layer (A horizon) of the laminated film of this invention, polyethylene, polypropylene, polybutene, the poly methyl pentene, etc. are mentioned as polyolefine system resin used as cavernous manifestation material. These are not necessarily limited to a homopolymer. Moreover, you may be the

copolymerization polymer which carried out the polymerization of two or more kinds of olefin system monomers, and the conversion polyolefin resin which copolymerized the organic-acid component etc. is sufficient.

[0045] Moreover, it is not necessary to necessarily use polyolefine system resin independently, and it may mix and use other accessory constituents (it is a polyolefine system resinous principle with few contents to a principal component) in addition to a principal component (most polyolefine resinous principles of a content).

[0046] Moreover, in this invention, it is hard to soften under an elevated temperature, and since the outstanding cavernous manifestation nature is discovered, especially poly methyl pentene resin is desirable also in said polyolefine system resin.

[0047] It is desirable especially desirable that a upper limit is 14.5 % of the weight to the resin constituent which constitutes a cavernous content layer (A horizon), and the content of the above-mentioned polyolefine system resin is 11.5 % of the weight. Moreover, it is desirable especially desirable that it is 2.0 % of the weight, and a lower limit is 4.0 % of the weight. Since the cavernous content in the cavernous content layer (A horizon) of a laminated film becomes less enough when there are too few contents of polyolefine system resin, a property required as a makeup sheet which is the suitable application of this invention is no longer acquired fully. On the other hand, if there are too many contents of polyolefine system resin, the stability of the extension process at the time of film production will no longer be acquired.

[0048] Moreover, although especially the polystyrene system resin used for the cavernous content layer (A horizon) of the laminated film of this invention is not limited, the conversion polystyrene resin which copolymerized each principal component, such as an organic-acid component besides the homopolymer which carried out the polymerization of the styrene monomer as typical resin, is mentioned. It is desirable especially desirable that a upper limit is 7.0 % of the weight to the resin constituent which constitutes a cavernous content layer, and the content of the above-mentioned polystyrene system resin is 5.0 % of the weight. Moreover, it is desirable especially desirable that it is 0.5 % of the weight, and a lower limit is 1.0 % of the weight. If there are too few contents of polystyrene system resin, the cavernous manifestation material particle which becomes polyester resin from immiscible resin will rough-decentralize, a cavity will become large, and physical properties, such as surface reinforcement, will be spoiled. On the other hand, if there are too many contents of polystyrene system resin, the rigidity of a film will become high and flexibility will be spoiled.

[0049] In the laminated film of this invention, it is desirable especially desirable that a upper limit is 15.0 % of the weight to the resin constituent which constitutes a cavernous content layer, and the sum total content containing the above-mentioned polyolefine system resin and the above-mentioned polystyrene system resin of thermoplastics immiscible to polyester resin is 10.0 % of the weight. Moreover, it is desirable especially desirable that it is 2.5 % of the weight, and a lower limit is 4.0 % of the weight. If there are too few sum total contents of thermoplastics immiscible to polyester resin, the cavernous content of a film will become inadequate and a property required as a makeup sheet which is the suitable application of this invention will no longer be acquired fully. On the other hand, if there are too many contents of polystyrene system resin, the stability of the extension process at the time of film production will no longer be acquired.

[0050] Moreover, it is desirable especially desirable that the ratio (etaO/etaS) of melt viscosity etaO (poise) of polyolefine system resin and melt viscosity etaS (poise) of polystyrene system resin is 0.80 or less, and the polyolefine system resin used for the cavernous content layer (A horizon) of the laminated film of this invention and polystyrene system resin are 0.50 or less. If the ratio of the above-mentioned melt viscosity is too large, since distribution of polystyrene system resin will become an ununiformity and the phase structure in the dispersing element of immiscible resin will become unstable, the distributed condition of cavernous manifestation material gets worse, and it becomes difficult to make void laminating number density of the film thickness direction into said range.

[0051] In addition, when mixing and using two or more kinds of polyolefine system resin, it is desirable to set up resin viscosity so that the relation of the above-mentioned melt viscosity may be satisfied [the melt viscosity of polyolefine system resin (principal component) with most contents] for etaO (poise).

[0052] When using poly methyl pentene resin as a principal component of polyolefine system resin, it is desirable especially desirable that it is 3,500poise or less, and melt viscosity etaO of the poly methyl pentene resin concerned is 2,000poise or less. If the melt viscosity of melt viscosity etaO of poly methyl pentene resin is too large, the resin concerned will become is hard to distribute a film raw material in kneading and the process which carries out extrusion molding, and a property required as a makeup sheet which is the suitable application of this invention will no longer be acquired fully.

[0053] Moreover, it is desirable especially desirable that a upper limit is 10,000poise, and melt viscosity etaS of polystyrene system resin is 7,000poise. Moreover, it is desirable especially desirable that it is 1,000poise, and a lower limit is 3,000poise. The resin concerned becomes if melt viscosity etaS of polystyrene system resin is too large, will be hard to distribute a film raw material in kneading and the process which carries out extrusion molding, on the other hand, if melt viscosity etaS of polystyrene system resin is too small, distribution of the resin concerned will become uneven, and a property required as a makeup sheet which is the suitable application of this invention is no longer acquired fully in both cases.

[0054] Moreover, in the laminated film of this invention, in order to raise concealment nature further, an inorganic or organic inactive particle may be contained if needed. It is not limited especially although things generally used, such as an organic particle besides inorganic particles, such as a titanium dioxide, a silica, a kaolinite, talc, a calcium carbonate, a zeolite, an alumina, a barium sulfate, carbon black, a zinc oxide, and zinc sulfide, are assumed as said inactive particle.

[0055] Moreover, it is not limited especially about the content of an inactive particle, either. However, when making an inactive particle contain, it is the range in which the property as a makeup sheet which is the suitable application of this invention is not reduced, and the class and content should be set up.

[0056] Moreover, in the laminated film of this invention, a spreading layer may be prepared at least in the one side. Functions, such as an adhesive property and antistatic nature, can be given by preparing a spreading layer. As binder resin which mainly constitutes a spreading layer, although copolymerized polyester resin is desirable, the macromolecule resin which improves the adhesive property of usual polyester film, such as polyurethane resin, polyester polyurethane resin, and acrylic resin, the compound

which raises antistatic nature are applicable.
[0057] As an approach of preparing a spreading layer, approaches usually used, such as a gravure coat method, a kiss coat method, a DIP method, a spray coat method, a curtain coat method, an air knife coat method, a blade coat method, and a reverse roll coat method, are applicable. As a phase to apply, any approaches, such as an in-line coating method applied the extension front of a film and after vertical extension or an off-line coating method applied to the film front face which biaxial orientation processing ended, are possible.
[0058] The manufacture approach of the cavernous content polyester system laminated film roll of this invention is arbitrary. Although not restricted especially, carry out melting of the mixture which consists of the above-mentioned presentation, for example, carry out extrusion molding to the shape of a sheet, and it considers as an unstretched film. After extending this unstretched film in the at least 1 direction, cooling after carrying out heat relaxation processing heat setting processing and if needed subsequently, and cutting both ends, the general method of required size carrying out a slit and rolling round in the shape of a roll to a paper tube etc. can be used.
[0059] In this invention, polyester resin and immiscible thermoplastics are distributed in polyester resin in the process which fuses and carries out extrusion molding of the raw material. Although the resin which polyester resin and this are made to mix used what is supplied in the pellet configuration in the example of this invention, it is not limited to this.
[0060] According to the target presentation, the raw material fed into an extruder in order to carry out melting shaping carried out pellet mixing, and prepared these resin for the shape of a film. However, as for the polyester resin and polyolefine system resin which are used by this invention, generally, it is desirable to add the device which is not re-separated in the process in which the pellet which specific gravity differs greatly and mixed once is supplied to an extruder.
[0061] As a desirable example of a policy for this, kneading pelletizing is carried out combining some or all of raw material resin in advance, and the approach of preparing as a masterbatch pellet is mentioned. Although this approach was used in the example of this invention, it is not limited especially unless the effectiveness of this invention is barred.
[0062] Moreover, in the extrusion of the mixed stock of these immiscible resin, even after mixing in the state of melting and carrying out micro-disperse, there is a property which said immiscible resin distributed in the shape of a particle re-condenses from work that the surface energy of resin will be decreased. In case this carries out extrusion molding of the unstretched film, it is a phenomenon used as the hindrance of the physical-properties manifestation which is made to rough-decentralize cavernous manifestation material and asks for it.
[0063] In order to prevent this, in case the film of this invention is fabricated, it is desirable to carry out micro-disperse of the cavernous manifestation material beforehand using a twin screw extruder with mixed, more high effectiveness. Moreover, when this is difficult, it is also desirable to supply raw material resin to a feed block or a dice through a static mixer as an auxiliary means from an extruder.
[0064] A static mixer, an orifice, etc. can be used as a static mixer used here. However, since the resin which heat-deteriorated all over the melt line is made to pile up when

these approaches are taken, cautions are required. In addition, since it is thought that re-condensation of the immiscible resin of a melting condition advances with time amount in the state of low shear, it becomes fundamental solution to decrease the residence time of melting resin all over the melt line to a dice from an extruder. In this invention, considering as 30 or less minutes makes this time amount 15 or less minutes preferably desirable especially.

[0065] Moreover, as for the laminating of a cavernous content layer (A horizon) and the layer (B horizon) which mainly consists of polyester resin, it is desirable to carry out in the state of melting with a coextrusion process.

[0066] The stretch orientation of the unstretched film obtained as mentioned above is carried out to at least 1 shaft orientations. Extension and orientation conditions are closely related to the physical properties of a film. below, most generally it is used -- serially -- the biaxial-stretching approach, especially an unstretched film -- method ** of straight side -- the approach of subsequently to the cross direction extending is taken for an example, and extension and orientation conditions are explained.

[0067] At a vertical extension process, it extends between the rolls of the 2 or the a large number book with which peripheral speed differs. Also by the approach using a heating roller as a heating means at this time, the approach using the non-contact heating approach may be used, and they may be used together. Subsequently, an uniaxial stretched film is introduced into a tenter and it extends 2.5 to 5.0 times at the following (Tm-10 degree C) temperature crosswise. (However, Tm shows the melting point of polyester.)

[0068] Moreover, heat setting processing is performed to the above-mentioned biaxially oriented film. Performing heat setting processing in a tenter carries out in the range of - (Tm-60 degree C) Tm preferably desirable especially. Furthermore, in order to improve dimensional stability further, relaxation processing may be performed to the cross direction and/or a longitudinal direction.

[0069] Thus, the obtained cavernous content polyester system laminated film is prepared between a pattern printing layer and base materials, such as a wood metallurgy group, when using for suitable makeup sheets especially.

[0070]

[Example] Next, this invention is explained in detail using an example and the example of a comparison. First, the measuring method and the evaluation approach which were used by this invention are shown below.

[0071] (1) The spectral reflectance of a spectral-reflectance film was measured in reflective mode using the spectrophotometer (the Hitachi, Ltd. make, U3500). It asked for the reflection factor of the reflection factor R450 in 450nm, and the reflection factor R650 in 650nm, and asked for those reflection factor ratios (R650/R450).

[0072] (2) The color difference was measured to the longitudinal direction of the difference film roll of the maximum of the color difference (deltaE), and the minimum value with the color difference meter (the Nippon Denshoku Co., Ltd. make, Z-1001DP). The film roll was sampled in 1,000m every 20m, and searched for the difference of the maximum of the color difference, and the minimum value in those samples.

[0073] (3) In five places of the part where samples differ, the cutting plane perpendicular to the vertical extension direction of a film, parallel, and a film plane was observed using the cavernous laminating number density scanning electron microscope of an A horizon.

Said cutting plane was observed by one 300 to 3,000 times the suitable scale factor of this, and the photograph which can check the distribution condition of the cavity of the cavernous content layer (A horizon) in a laminated film was taken. The straight line was drawn at right angles to a film front face in the location of the arbitration on a photograph, and counting of several Ns (the number of laminatings) of the cavity at which this straight line is crossed was carried out. Moreover, along with this straight line, thickness T (micrometer) of the A horizon in a laminated film was measured, the product number of layers N of a cavity (individual) was **(ed) by the thickness of an A horizon, and cavernous laminating number density N/T (a piece/micrometer) was calculated. In addition, measurement was performed by five per photograph, the average of the cavernous laminating number density of a total of 25 A horizons was calculated, and it considered as the cavernous laminating number density (a piece/micrometer) of the A horizon of a sample.

[0074] (4) Melt viscosity (etaO, etaS)

The resin temperature of 285 degrees C and the melt viscosity in the 100/second of shear rates were measured using the flow tester (the Shimadzu make, CFT-500). since [in addition,] measurement of the melt viscosity in the 100/second of shear rates is difficult to fix to a 100-/second and to perform a shear rate -- a suitable load -- using -- the shear rate of larger arbitration than the shear rate and said shear rate of arbitration of under a 100-/second -- melt viscosity -- measuring -- an axis of ordinate -- melt viscosity and an axis of abscissa -- a shear rate -- taking -- both -- a logarithm -- it plotted in the graph. The two aforementioned points were searched for for the melt viscosity (eta: poise) in the 100/second of shear rates by the epilogue and interpolation in a straight line.

[0075] (5) Film thickness and an apparent-density-gravity film were cut down four sheets for the square of 5.00cm around, and were made into the sample. This was made into the four-sheet pile, ten points were measured by 4 figures of significant figures using the film thickness meter (the product made from SONY Precision Technology Inc., DigitalMicrometer M-30), and the average of heavy thickness was calculated. This average was **(ed) by 4, the digit of the 4th place of a decimal was rounded off, and it asked for the film thickness (t:micrometer) of the average per sheet with the digit of the 3rd place of a decimal. Moreover, the weight (w:g) of these four samples was measured to 4 figures of significant figures with the automatic even balance, and it asked for apparent density gravity by the following type. In addition, apparent density gravity was rounded off to the triple figures significant figure.

Apparent density gravity (g/cm3) = wx104/(5.00x5.00xtx4)

[0076] (6) After dissolving the polyester raw material in the mixed solvent of 60 % of the weight of intrinsic-viscosity phenols of polyester resin, and 40 % of the weight of 1,1,2,2-tetrachloroethane and filtering solid content with a glass filter, it measured at 30 degrees C.

[0077] (7) surface reinforcement -- the pure film was cut down to 5cm long and 20cm wide, and was completely pasted up on monotonous glass using polyester pressure-sensitive-adhesive-double-coated-tape A. With a width of face of 24mm adhesive tape B (the Nichiban Co., Ltd. make, Scotch tape) is stuck on this front face covering die length of 35mm, and it is left for 1 minute. Then, it tore off at a stretch in the direction perpendicular to a glass side, and the field was observed. It presupposed that in which the film front face separated by 50% or more of the exfoliation aspect product of said

adhesive tape B "was exfoliated", and the case where they were "O" (surface reinforcement is excellent) and more than a moiety about the case where "exfoliation" frequency is under a moiety in 5 times or more of repeats was estimated as "x" (surface reinforcement is inferior).

[0078] (8) The number average particle diameter of a particle was computed from the transmission electron microscope image about the pigment particle of the shape of mean-particle-diameter powder of a pigment, and it considered as mean particle diameter.

[0079] (9) Total light transmission was measured using the hazemeter (the Nippon Denshoku Industries Co., Ltd. make, NDH1001 DP), the light transmission of all light transmission films was ranked on the following criteria, and O was considered as success. O Exceed :<=10%**:10%, and it is less than [50%] x:>=50%[0080]. (10) Gravure gave the pattern layer of the grain to the film front face using the ink which consists of a grace nitrocellulose alkyd resin of a printing side, the visual judgment of result nature and the stability of a result of two or more sheets was carried out as follows, and O was considered as success.

O :fitness ** : x:printing appearance a little with a bad printing appearance is a defect

[0081]. (11) Visual evaluation of the color tone change of the part which the front face of the makeup sheet which prepared the pattern printing layer in the front face of the color tone change polyester system film at the time of wounded was scraped in the coins, and even a pattern printing layer and polyester film broke, and broke in that case was carried out. The case where O and color tone change were large and a blemish was conspicuous in the case where color tone change is small and a blemish is not conspicuous was made as x, and the middle was made into **.

[0082] 20 % of the weight (the product made from Japanese PORISUCHI, G797N) of polystyrene resin 60 % of the weight (the Mitsui Chemicals, Inc. make, DX820) of the poly methyl pentene resin whose example 1 (adjustment of a master pellet) melt viscosity (etaO) is 1,300poise, and whose melt viscosity (etaS) are 3,900poise, and melt viscosity supplied what carried out pellet mixing of the 20 % of the weight (grand polymer company make, J104WC) of the polypropylene resin which is 2,000poise to the vent type twin screw extruder which carried out temperature control to 285 degrees C, and carried out preliminary kneading. This melting resin was continuously supplied to the vent type monopodium kneading machine, was kneaded, and was extruded, the obtained strand was cooled and cut, and the cavernous manifestation material content master pellet (M1) was adjusted.

[0083] Moreover, distributed mixing of the rutile-titanium-dioxide particle 46 weight section, the carbon black 0.22 weight section, the red ferrous-oxide 2.6 weight section, and the titan yellow 37.8 weight section was carried out, and the fine particles of the color pigment particle mixture (P) whose mean particle diameter is 0.5 micrometers were obtained. in addition, this color pigment particle (mixture P) 50 % of the weight to which each color pigment performed dry classification processing beforehand -- receiving -- a law -- the constituent which mixed 50 % of the weight of polyethylene terephthalate resin of intrinsic-viscosity 0.62 dl/g obtained by the method was supplied and kneaded to the vent type biaxial extruder, and it extruded in the shape of a strand. The obtained strand was cooled and cut and the color pigment content master pellet (M2) was adjusted.

[0084] (Adjustment of a film raw material) The 6 % of the weight (M1) of the above-mentioned cavernous manifestation material content master pellets which performed the

vacuum drying of 4 hours at 90 degrees C, and the 30 % of the weight (M2) of the above-mentioned master pellets which performed the vacuum drying of 8 hours at 140 degrees C were mixed with 64 % of the weight of polyethylene terephthalate resin of intrinsic-viscosity 0.62 dl/g which performed the vacuum drying of 8 hours at 140 degrees C, and it considered as the film raw material for A horizons (C1).

[0085] Subsequently, the 70 % of the weight of the same polyethylene terephthalate resin as what was used for the film raw material (C1), and the 30 % of the weight (M2) of the above-mentioned master pellets were mixed, and it considered as the film raw material for B horizons (C1).

[0086] In these measuring mixing actuation, the high precision measuring feeder of continuous running was used, and the hopper for preservation used the small area-of-base type with few segregations by a specific gravity difference etc. temporarily.

[0087] (Production of an unstretched film) The film raw material for B horizons (C2) was separately supplied to the extruder (II) which carried out temperature control to 290 degrees C at the extruder (I) which carried out temperature control of the above-mentioned film raw material for A horizons (C1) to 285 degrees C, respectively. Also in these measuring mixing actuation, the high precision measuring feeder of continuous running was used, and the hopper for preservation used the small area-of-base type temporarily.

[0088] The melting resin breathed out from an extruder (I) also led the resin breathed out from an extruder (II) through a static mixer to the feed block through the static mixer, and the laminating of the layer (A horizon) which consists of the layer (B horizon) and polyethylene terephthalate resin which consist of a film raw material (C1), and a master pellet (M2) was carried out to the order of a B horizon / A horizon / B horizon. It co-extruded from the T die on the cooling roller which carried out temperature control of this to 25 degrees C, and the unstretched film with a thickness of 180 micrometers was produced. In addition, the extruder by the side of an A horizon and a B horizon and the rotational frequency of a gear pump were adjusted so that the thickness ratio of each class might be set to B/A/B=20/60/20 in the discharge quantity of each extruder.

[0089] (Production of a biaxially oriented film) Homogeneity heating was carried out at 65 degrees C using the heating roller, and the vertical extension of the obtained unstretched film was increased 3.4 times between the nip rolls which are two pairs from which peripheral speed differs. At this time, as auxiliary heating apparatus of a film, both sides of a film were countered, and the infrared-heating heater which equipped nip roll pars intermedia with the golden reflective film was installed (distance of a film front face to 1cm), and was heated. The original fabric after vertical extension was quenched with the metal roll which carried out temperature control to 25 degrees C. Thus, by carrying out horizontal extension, leading the obtained uniaxial stretched film to a tenter, performing [heating at 150 degrees C,] heat treatment for 5 seconds 3.7 times at 230 degrees C, carrying out width-of-face immobilization, and making relaxation processing carry out crosswise 3% at 200 more degrees C, subsequently the handle part of both ends was trimmed by the cooling process, and a little more than [1000m] was rolled round for the cavernous content polyester system laminated film with a thickness of 20 micrometers in the shape of a roll. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0090] In example 2 example 1, the raw material presentation of a B horizon was made

into 80 % of the weight of polyethylene terephthalate resin, and 20 % of the weight (M2) of master pellets, and the raw material presentation of an A horizon was made into 74 % of the weight of polyethylene terephthalate resin, the 6 % of the weight (M1) of the above-mentioned master pellets, and 20 % of the weight (M2) of master pellets. Furthermore, the extruder by the side of an A horizon and a B horizon and the rotational frequency of a gear pump were adjusted so that the thickness ratio of each class might be set to B/A/B=10/80/10 in the discharge quantity of each extruder, and the unstretched film with a thickness of 460 micrometers was produced. Subsequently, on the same conditions as an example 1, biaxial stretching, heat setting processing, and relaxation processing to the cross direction were performed, and the cavernous content polyester system laminated film roll with a thickness of 50 micrometers was obtained. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0091] In example of comparison 1 example 1, the raw material presentation of a B horizon was made into polyethylene-terephthalate-resin 80 amount % and 20 % of the weight (M2) of master pellets, and the raw material presentation of an A horizon was made into 80 % of the weight of polyethylene terephthalate resin, and 20 % of the weight (M2) of master pellets. Furthermore, the extruder by the side of an A horizon and a B horizon and the rotational frequency of a gear pump were adjusted so that the thickness ratio of each class might be set to B/A/B=10/80/10 in the discharge quantity of each extruder, and the unstretched film with a thickness of 550 micrometers was produced. Subsequently, on the same conditions as an example 1, biaxial stretching, heat setting processing, and relaxation processing to the cross direction were performed, and the polyester system laminated film roll with a thickness of 50 micrometers was obtained. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0092] In example of comparison 2 example 1, the raw material presentation of a B horizon was made into 50 % of the weight of polyethylene terephthalate resin, and 50 % of the weight (M2) of master pellets, and the raw material presentation of an A horizon was made into 50 % of the weight of polyethylene terephthalate resin, and 50 % of the weight (M2) of master pellets. Furthermore, the extruder by the side of an A horizon and a B horizon and the rotational frequency of a gear pump were adjusted so that the thickness ratio of each class might be set to B/A/B=20/60/20 in the discharge quantity of each extruder, and the unstretched film with a thickness of 230 micrometers was produced. Subsequently, on the same conditions as an example 1, biaxial stretching, heat setting processing, and relaxation processing to the cross direction were performed, and the polyester system laminated film roll with a thickness of 20 micrometers was obtained. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0093] In example of comparison 3 example 1, the raw material presentation of a B horizon was made into 30 % of the weight of polyethylene terephthalate resin, and 70 % of the weight (M2) of master pellets, and the raw material presentation of a B horizon was made into 30 % of the weight of polyethylene terephthalate resin, and 70 % of the weight (M2) of master pellets. Furthermore, the extruder by the side of an A horizon and a B horizon and the rotational frequency of a gear pump were adjusted so that the thickness ratio of each class might be set to B/A/B=20/60/20 in the discharge quantity of

each extruder, and the unstretched film with a thickness of 230 micrometers was produced. Then, although it was going to carry out biaxial stretching of the unstretched film like the example 1, fracture was able to occur frequently and was not able to produce a film. The configuration of a non-extended laminated film was shown in Table 1.

[0094] In example of comparison 4 example 1, the master pellet (M3) which performed dry classification processing beforehand and which consists of 50 % of the weight of rutile titanium dioxides with a mean particle diameter of 0.5 micrometers and 50 % of the weight of polyethylene terephthalate resin was used instead of the master pellet (M2). The raw material presentation of a B horizon was made into 50 % of the weight of polyethylene terephthalate resin, and 50 % of the weight (M3) of master pellets, and the raw material presentation of an A horizon was made into 50 % of the weight of polyethylene terephthalate resin, and 50 % of the weight (M3) of master pellets. Furthermore, the extruder by the side of an A horizon and a B horizon and the rotational frequency of a gear pump were adjusted so that the thickness ratio of each class might be set to B/A/B=10/80/10 in the discharge quantity of each extruder, and the unstretched film with a thickness of 550 micrometers was produced. Subsequently, on the same conditions as an example 1, biaxial stretching, heat setting processing, and relaxation processing to the cross direction were performed, and the polyester system laminated film roll with a thickness of 50 micrometers was obtained. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0095] In example of comparison 5 example 1, the regurgitation of a B horizon was stopped and the raw material presentation of an A horizon was made into 40 % of the weight of polyethylene terephthalate resin, 30 % of the weight (M1) of master pellets, and 30 % of the weight (M2) of master pellets. The unstretched film with a thickness of 420 micrometers was produced, subsequently, on the same conditions as an example 1, biaxial stretching, heat setting processing, and relaxation processing to the cross direction were performed, and the cavernous content polyester system film roll with a thickness of 50 micrometers was obtained. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0096] Instead of the master pellet (M2), using the color pigment powder object which has not carried out dry classification processing, the master pelletizing process when creating a master pellet (M2) was skipped, and usual equipment was used, and the hopper and the measuring instrument fed a pigment and the mixture of resin into the extruder of a film production machine directly, and produced the film in example of comparison 6 example 1. The polyester system laminated film roll with a thickness of 50 micrometers was obtained as mentioned above. The characteristic value of the film obtained in Table 1 in the configuration of a laminated film was shown in Table 2.

[0097]

[Table 1]

	スキン層(B層)		コア層(A層)			着色顔料の分級処理の有無	偏析操作の有無	層構成 B/A/B
	ポリエステル樹脂の含有量 (wt%)	着色顔料の含有量 (wt%)	ポリエステル樹脂の含有量 (wt%)	非相溶な熱可塑性樹脂の含有量 (wt%)	着色顔料の含有量 (wt%)			
実施例1	85	15	79	6	15	有	有	20/60/20
実施例2	90	10	84	6	10	有	有	10/80/10
比較例1	90	10	90	0	10	有	有	10/80/10
比較例2	75	25	75	0	25	有	有	20/60/20
比較例3	65	35	65	0	35	有	有	20/60/20
比較例4	75	25	75	0	25	有	有	10/80/10
比較例5	—	—	55	30	15	有	有	—/100/—
比較例6	85	15	85	0	15	無	無	20/60/20

[0098]
[Table 2]

	フィルム特性								化粧シート特性	
	ボイド積層数密度 (個/μm)	反射率比 R650/R450	ロール内の色差の最大値と最小値の差	製膜性	積層フィルムの厚み (μm)	見かけ密度 (g/cm³)	全光線透過率 (%)	表面強度	印刷性	受像時の色調変化
実施例1	0.40	1.9	0.4	○	20	1.12	9 ○	○	○	○
実施例2	0.42	1.4	0.3	○	50	1.11	3 ○	○	○	○
比較例1	—	2.7	0.5	○	50	1.42	6 ○	○	△	○
比較例2	—	2.7	0.5	○	20	1.47	12 △	○	△	○
比較例3	—	—	—	×	(20)	—	(5)	—	—	—
比較例4	—	0.9	0.2	○	50	1.45	8 ○	○	△	×
比較例5	0.16	1.4	1.8	○	50	0.80	5 ○	×	×	○
比較例6	—	1.8	2.5	○	50	1.42	6 ○	○	×	○

[0099] From Tables 1 and 2, it can consider as follows. The cavernous content polyester system laminated film which was obtained in the above-mentioned examples 1 and 2 and with which are satisfied of all the requirements for the invention in this application has few differences in a color tone with a pattern printing layer, and it has the description with which a blemish cannot be easily conspicuous. Moreover, when it considers as a split, it excels in concealment nature.
[0100] On the other hand, since the polyester system laminated film obtained in the examples 1, 2, 4, and 6 of a comparison does not contain immiscible thermoplastics in polyester resin, it is insufficient of cushioning properties. Furthermore, in the example 6 of a comparison, since the color pigment was not fully distributing in polyester resin, printing grace was inferior with the big and rough projection on the front face of a film.
[0101] Moreover, a polyester system film suitable as a sheet (film) used for the sheet used between the base material of a panel and a pattern printing layer since concealment

nature runs short in the example 2 of a comparison, film production is difficult in the example 3 of a comparison, the amount of scratch is conspicuous in the examples 4 and 5 of a comparison and surface reinforcement runs short further in the example 5 of a comparison, and a makeup sheet was not able to be obtained.

[0102]

[Effect of the Invention] Since the cavernous content polyester system laminated film roll obtained by this invention prepares the cavernous content layer (A horizon) of a laminated film, and the layer (B horizon) which mainly becomes at least one side of an A horizon from polyester resin and is carrying out cavernous laminating number density of an A horizon to beyond the specific value, it is excellent in concealment nature, cushioning properties, surface reinforcement, and all the film production stability.

[0103] Furthermore, since each class is made to contain at least two or more sorts of color pigments, a reflection factor ratio (450nm and 650nm) is made into the specific range and the difference of the maximum of the color difference within a film roll and the minimum value is made below into the specific value, the difference of a color tone with a pattern printing layer is small, and fluctuation of the color difference in a film roll also has them. [few]

[0104] Therefore, it ****s in the size which asks for the cavernous content polyester system laminated film roll of this invention, in case it is used as the sheet used between the base material of a panel, and a pattern printing layer, or a sheet (film) used for a makeup sheet, it excels in the printing grace of a pattern printing layer, and the remarkable effectiveness that there is little color tone change at the time of wounded is acquired.

CLAIMS

[Claim(s)]

[Claim 1] The cavernous content layer which mainly becomes polyester resin and said polyester resin from the constituent containing immiscible thermoplastics (A horizon), It is the cavernous content polyester system laminated film roll with which the laminating of the layer (B horizon) which mainly becomes at least one side of an A horizon from polyester resin was carried out. Said both A horizons and B horizons contain at least two or more sorts of color pigments. And the cavernous laminating number density as which an A horizon is defined by the following formula (1) is 0.20 or more pieces/micrometer. Furthermore, said film front face is a cavernous content polyester system laminated film roll characterized by for the reflection factor ratios (R650/R450) in 450nm and 650nm being 1-5, and the difference of the maximum of the color difference (deltaE) within the same film roll and the minimum value being 1.0 or less.

Cavernous laminating number density (a piece/micrometer) = the number of cavities of the A horizon in the film thickness direction (individual) Thickness of a /A horizon (micrometer) -- (1)

[Claim 2] Said color pigment is a cavernous content polyester system laminated film roll according to claim 1 characterized by mean particle diameter being 5 micrometers or less.

[Claim 3] The cavernous content polyester system laminated film roll according to claim 1 or 2 whose thermoplastics immiscible to said polyester resin is characterized by

including polyolefine system resin and polystyrene system resin.

[Claim 4] Said laminated film is a cavernous content polyester system laminated film roll claims 1 and 2 characterized by 0.70-1.45g /of apparent density gravity being [cm] 3, or given in three.

[Claim 5] Said laminated film is a cavernous content polyester system laminated film roll claims 1, 2, and 3 characterized by thickness being 100 micrometers or less, or given in four.